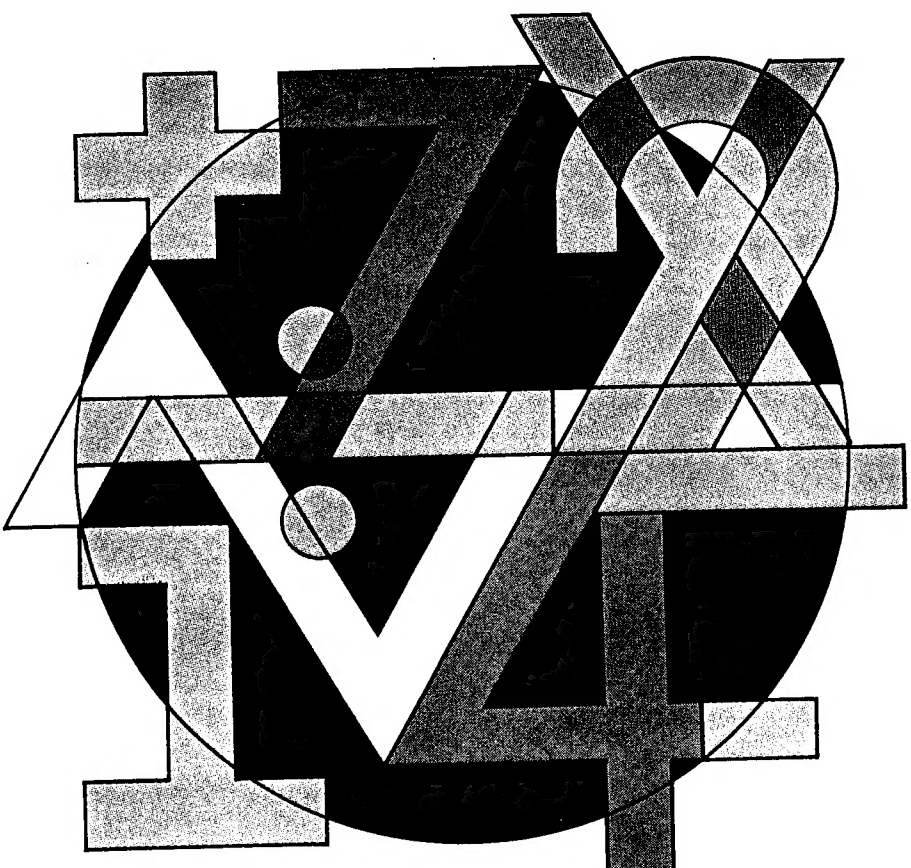
Calculators' Fast New Powers

By ANTHONY D. K. CARDING, Associate Editor



Sophisticated capabilities and millisecond operating speeds mark the new breed of calculators in the fast-moving market of the Seventies.

AT first sight, today's calculator market might seem a bit bewildering to the manager who wants to buy one or more of the new machines. Electronic, electro-mechanical and rotary machines are available at prices ranging from just over $100 to around $5,000. Manufacturers and dealers offer machines with such sophisticated capabilities as automatic square root, antilogarithm and trigonometric functions. Speeds are quoted in milliseconds as opposed to seconds, and the term "integrated circuitry" is heard with increasing frequency.

Against this variety of choices, the manager has to balance his needs, purchasing budget, operating personnel and office layout. It is not easy, but by looking carefully at requirements, costs and other factors, you can decide what type of machine would best suit your office, and find one in the right price range for your operation.

The proliferation of models has been brought about by the influx of new electronic calculators seeking a foothold in a still fluid market. While production of electro-mechanical and rotary calculators has been decreasing in many cases, the last few years has seen something like 100 electronic models introduced to the public. And more are on the way.

In a bid for a share of the U.S. calculator market, estimated as being worth around $350-million and growing, electronic machines have been coming into this country in ever-increasing numbers from Japan, West Germany, Italy and Holland. Japan is the largest foreign producer, with companies like Sharp, Canon, Toshiba and Sony marketing a wide range of Japanese-made machines. The use of integrated circuit modules, which hold a mass of fine wiring in a silicon block no bigger than a paper clip, has brought down the weight and size of electronic machines greatly. In addition, these circuits have streamlined production techniques and helped reduce manufacturing costs. As development costs begin to be written off over the next few years, it is likely that prices will drop still further.

TAPE

THE new electronic machines are of two main types—printing or display. The printing machines are among the higher priced calculators, generally ranging in price between $1,000 and $5,000. Usually, all significant factors are printed on the tape in addition to the result, and some of the newer machines of this kind such as the Philips P-251, the Canon 1200P and the Sharp 622, are now using electronic print-out, doing away with ink, pads or type. This system allows higher speed calculations, and reduces the noise level of operation to virtual silence. The number of moving parts are also reduced, making for lower maintence costs. Some machines of this type can print digits and symbols at speeds of up to 90

characters per second.

Other electronic printing calculators, including machines from Toshiba, Paillard, Brother and SCM, use a more standard mechanical print-out device, which means a certain level of noise, and a slower rate of operation. Despite this, these machines still produce faster results than mechanical calculators, and are able to handle a wider range of calculations.

Results from display calculators are shown either on a set of Nixie tubes, as with the Sharp CS-33A, the Canon 162, the Deltek IC8 and similar models, or a cathode ray tube, like Monroe's Model 820 and the Victor 14-321. In the case of a Nixie display, only the final result of a calculation is shown in a single row of figures, although some models show entries as they are made, each entry disappearing as a new one takes its place.

Cathode ray tube displays show more information than is possible with a row of Nixie tubes. Usually several lines of figures can be displayed at once, incorporating significant factors of the calculation and intermediate results.

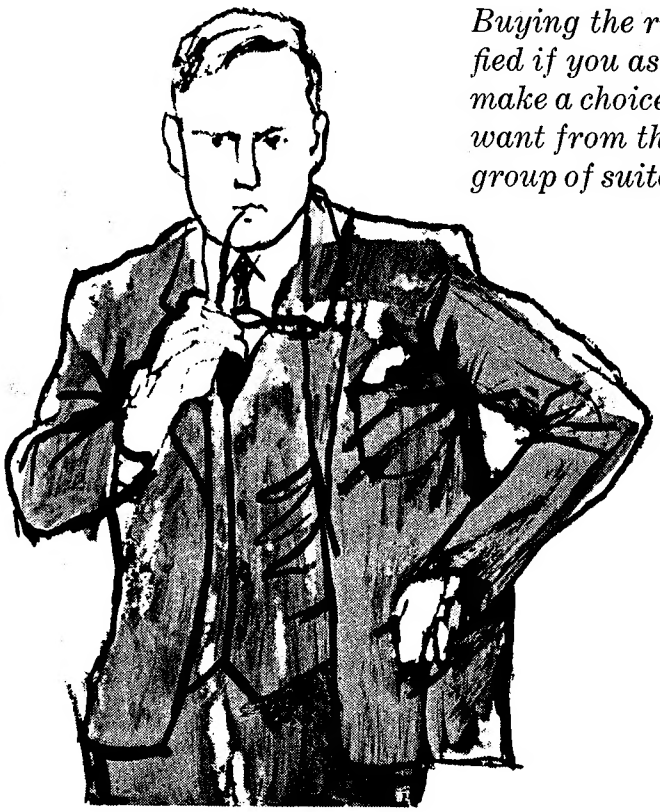
RECORD

BOTH types of display calculators give results faster than a machine giving print-out, but of course, provide no permanent record of calculations, which is sometimes needed for records. However, some manufacturers such as Hewlett-Packard, Sony and Wang, offer optional printing attachments to provide print-out from a display calculator.

The main advantages of electronic machines are their speed, versatility, quietness and portability. While priced above mechanical equipment, they often offer features which are unavailable outside electronics. These may range from a floating decimal point, which automatically locates itself in the correct position in an answer, to programming capability, which enables routine tasks to be performed automatically, using a punched card or tape.

While it is the electronic machines that are providing most of the glamour to the field, there are still many applications and situations where an electro-mechanical or rotary machine will answer all requirements for less cost. Where speed or highly sophisti-

Questions to Ask



Buying the right calculator for your company will be simplified if you ask yourself some basic questions before trying to make a choice of a specific model. By examining what you will want from the machine, you can narrow the choice down to a group of suitable models from which to make a final selection.

Ask Yourself:

1) What will the calculator be asked to do? Today's machines feature a wide range of capabilities, but not all of them will be applicable to your needs. Avoid buying sophisticated capabilities which will never be used.

2) Where will the machine be used? Some of the modern calculators, especially the electronic display models, are almost completely silent. This is an asset if they are to be used in a quiet environment.

3) Is paper print-out necessary for records? If so, the choice of models is narrowed down to electronic or electro-mechanical printing machines.

4) How many people will be using the calculator? If the machine is to be moved about from desk to desk or office to office, look for a lightweight model for easy portability.

5) What experience have you had in the past with specific makes or models? This can be an invaluable guide in making a choice.

cated capabilities are not the primary criteria, and where print-out is a must, an electromechanical calculator will probably prove to be adequate for the job, at an initial outlay of perhaps a third that of an electronic printer.

Also, with the strong challenge of the electronic machines, some manufacturers are bringing down their prices of mechanical machines in order to reduce their inventory.

RESULTS

IN addition, there are some statistical calculations, such as correlations, summations and those involving complementary results which are handled better, if perhaps slower, by a mechanical calculator which can produce multiple results from a single operation, than by a low-price electronic machine. This can be handled by a programmable machine, but here the initial cost would be much higher.

At the low end of the price scale are rotary machines such as those manufactured by Bohn Rex-Rotary and Facit-Odhner. These sell at between $140 and $600. Where cost is a consideration, and there is no need for more complex calculations, this type of machine is a money-saver.

Among the manufacturers offering machines with electronic print-out are North American Philips, Sharp and Canon. The P-251 from Philips employs a print-out device with tiny needles which flick against a ribbon to transfer numerals onto the paper roll. Among its other features are selective round-off, automatic percentages, and an accumulating memory which stores up to 14 digits of positive or negative results for use in further calculations.

Print-out from the Sharp 622 is etched into treated paper by an electronic stylus. This 16-digit machine is fully automatic and includes storage facilities, a preset decimal point and two working registers.

Printing three lines per second, 15 characters per line, onto special roll paper, the Canon Model 1200P uses four recording pins mounted on a high-speed rotor to electronically mark out numerical data.

Other electronic calculators with print-out features include machines from Paillard, Brother International, Olivetti Underwood, Victor, Toshiba and Burroughs.

Paillard's Hermes 114 machine features a 50-step program register, which allows the oper-

Before You Buy

This in turn can be made easier by asking the calculator salesman a series of questions designed to indicate the most suitable machine for your needs. In addition, past experience with a particular make or model will help you make the final decision on the basis of reliability and service.

Ask the Salesman:

1) What service does the company offer after the sale? This can be a vital consideration, especially where your office is in a remote location.

2) What training time is necessary for personnel to learn how to operate the new machine? Most modern machines are designed for simplicity, but where sophisticated functions are involved, a certain amount of instruction will be needed.

3) In the event of breakdown, how soon are parts and a skilled repairman available. Electronic calculators are claimed by manufacturers to break down only rarely, since they contain a minimum of moving parts, but a higher degree of skill is needed to correct faults.

4) What is the possibility of machine obsolescence in the near future? With a fast-moving market, it is possible that the model you are considering is due to be replaced soon with a better, or lower priced, version.

5) Is the machine available on approval to make an in-office evaluation of its capabilities? This is often the best way to compare models and find the one best suited to your needs.

AM's GUIDE TO CALCULATORS

MANUFACTURER OR DISTRIBUTOR	MODEL NAME	PRICE	TYPE: Electronic Printing	TYPE: Electronic Display	TYPE: Electronic Printing/Display	TYPE: Mechanical Printing	TYPE: Rotary	KEYBOARD (Full, Abridged, 10-Key, etc.)	CAPACITY (No. of Columns)	FULLY OR SEMI-AUTOMATIC	STORAGE FACILITIES (Yes or No)	BACK TRANSFER FEATURE (Yes or No)	DECIMAL POINT IDENTIFICATION (Yes or No)	INQUIRY CARD NO. TO CIRCLE FOR MORE DATA
ADDO-X	4383	625				•		Ten-Key	11/13	Fully	Yes	Yes	Yes	60
ADDO-X	3683	585				•		Ten-Key	11/13	Fully	Yes	Yes	Yes	60
ADDO-X	4683	725				•		Ten-Key	11/13	Fully	Yes	Yes	Yes	60
ADDO-X	2383	385				•		Ten-Key	12/13	Fully	No	Yes	Yes	60
ADDO-X	2353	349				•		Ten-Key	12/13	Fully	No	No	Yes	60
ADDO-X	9628	1,195	•					Ten-Key	16	Fully	Yes	Yes	Yes	60
ADDO-XONIC	9357	745		•				Ten-Key	14	Fully	Yes	Yes	Yes	60
ADDO-XONIC	9667	995		•				Ten-Key	14	Fully	Yes	Yes	Yes	60
ADDO-XONIC	9958	1,195		•				Ten-Key	16	Fully	Yes	Yes	Yes	60
ALMA OFFICE MACHINES	Packard C-16	299				•		Ten-Key	11/12	Fully	Yes	Yes	Yes	61
ALMA OFFICE MACHINES	Sprint	107				•		Ten-Key	8/9	Semi	No	No	Yes	61
BOHN REX-ROTARY A DIVISION OF VICTOREEN	Contex 30	249					•	Ten-Key	11	Fully	–	–	Yes	62
BOHN REX-ROTARY A DIVISION OF VICTOREEN	Contex 10	139					•	Ten-Key	11	Semi-	–	–	Yes	62
BOHN REX-ROTARY A DIVISION OF VICTOREEN	Contex 55	349					•	Ten-Key	11	Fully	–	–	Yes	62
BROTHER INTERNATIONAL CORP.	412	795		•				Ten-Key	12	Fully	Yes	Yes	Yes	63
BROTHER INTERNATIONAL CORP.	514	895		•				Ten-Key	14	Fully	Yes	Yes	Yes	63
BROTHER INTERNATIONAL CORP.	614	1,095	•					Ten-Key	14	Fully	Yes	Yes	Yes	63
BURROUGHS	J800	359				•		Ten-Key	10/11	Semi	No	No	Yes	64
BURROUGHS	C3155	419		•				Ten-Key	8	Fully	No	Yes	Yes	64
BURROUGHS	C3207	995		•				Ten-Key	14	Fully	Yes	Yes	Yes	64
BURROUGHS	C3203	795		•				Ten-Key	12	Fully	Yes	No	Yes	64
BURROUGHS	C3205	895		•				Ten-Key	12	Fully	Yes	Yes	Yes	64
BURROUGHS	C3103	649		•				Ten-Key	12	Fully	No	No	Yes	64
BURROUGHS	C3316	1,195		•				Ten-Key	16	Fully	Yes	Yes	Yes	64
BURROUGHS	C4215	1,195	•					Ten-Key	16	Fully	Yes	Yes	Yes	64
BURROUGHS	C4315	1,295	•					Ten-Key	16	Fully	Yes	Yes	Yes	64
BUSICOM U.S.A.	207	2,995		•				Ten-Key	20	Fully	Yes	No	Yes	65
BUSICOM U.S.A.	162	1,275		•				Ten-Key	16	Fully	Yes	No	Yes	65
BUSICOM U.S.A.	162-C	1,095		•				Ten-Key	16	Fully	Yes	No	Yes	65
BUSICOM U.S.A.	141-DA	875		•				Ten-Key	14	Fully	Yes	No	Yes	65
BUSICOM U.S.A.	120-DA	595		•				Ten-Key	12	Fully	No	No	Yes	65
CANON	163	1,250		•				Ten-Key	16	Fully	Yes	Yes	Yes	66
CANON	162	1,150		•				Ten-Key	16	Fully	Yes	Yes	Yes	66
CANON	141	945		•				Ten-Key	14	Fully	Yes	Yes	Yes	66
CANON	120	545		•				Ten-Key	12	Fully	No	No	Yes	66
CINTRA, INC.	Cintra Scientist	3,780		•				Full	10 Digit plus Exp.	Fully	Yes	Yes	Yes	67
CINTRA, INC.	Pro-grammer	995		•				Full	25,600 steps	N.A.	Yes	Yes	N.A.	67
COMMODORE	402	249					•	Ten-Key	10/11	Fully	No	Yes	Yes	68
COMMODORE	1121	795		•				Ten-Key	12	Fully	Yes	Yes	Yes	68
COMMODORE	1161	995		•				Ten-Key	16	Fully	Yes	Yes	Yes	68
COMMODORE	AL-1000	1,495		•				Ten-Key	14	Fully	Yes	Yes	Yes	68
COMMODORE	512	499		•				Ten-Key	12	Fully	Yes	Yes	Yes	68
DELTEK BUSINESS MACHINES	Deltek IC8	595		•				Ten-Key	8/15	Fully	No	Yes	N.A.	69
DERO RESEARCH DEVELOPMENT CORP.	Sage 1	795		•				Ten-Key	10L-20D	Fully	Yes	No	Yes	70
DICTAPHONE CORP.	1420	875		•				Ten-Key	14	Fully	Yes	Yes	Yes	71
DICTAPHONE CORP.	1620	1,075		•				Ten-Key	16	Fully	Yes	Yes	Yes	71
DICTAPHONE CORP.	1630	1,295	•					Ten-Key	16	Fully	Yes	Yes	Yes	71
FACIT-ODHNER	1007	625					•	Ten-Key	16	Fully	Yes	Yes	Yes	72
FACIT-ODHNER	CA1 13	445					•	Ten-Key	9/8/13	Fully	Yes	Yes	Yes	72
FACIT-ODHNER	C1 13	185					•	Ten-Key	13	Manual	Yes	Yes	Yes	72

Calculators CONTINUED

ator to perform repetitive calculations by touching a program key, and then indexing the variables. An electronic interlock prevents more than one impulse at a time being entered into the machine, however fast the keys are pressed, and the print-out tape shows each function of a calculation, with negative factors and totals printed in red.

Model 614 from Brother International features a memory which can be used automatically or selectively. Decimals can be pre-set to eight places, and the machine can round up, round down or round off.

Negative numbers are also printed out in red on the Toscal BC-1413P from Toshiba. Deci-

...ELECTRONIC, ROTARY AND PRINTING

MANUFACTURER OR DISTRIBUTOR	MODEL NAME	PRICE	TYPE					KEYBOARD (Full, Abridged, 10-Key, etc.)	CAPACITY (No. of Columns)	FULLY OR SEMI-AUTOMATIC	STORAGE FACILITIES (Yes or No)	BACK TRANSFER FEATURE (Yes or No)	DECIMAL POINT IDENTIFICATION (Yes or No)	INQUIRY CARD NO. TO CIRCLE FOR MORE DATA
			Electronic Printing	Electronic Display	Electronic Printing/Display	Mechanical Printing	Rotary							
FACIT-ODHNER	1004	225					•	Ten-Key	9/13	Manual	Yes	Yes	Yes	72
FACIT-ODHNER	1051	599				•		Ten-Key	11/13	Fully	Yes	Yes	No	72
FACIT-ODHNER	1127	997		•				Ten-Key	14/14	Fully	Yes	Yes	Yes	72
FACIT-ODHNER	1125	1,197		•				Ten-Key	16/16	Fully	Yes	Yes	Yes	72
FACIT-ODHNER	1115	429		•				Ten-Key	16	Fully	Yes	Yes	Yes	72
FACIT-ODHNER	1153	1,195	•					Ten-Key	16	Fully	Yes	Yes	Yes	72
FRIDEN, DIV., SINGER CO.	1150	1,295	•					Ten-Key	13	Aut.	No	Yes	Yes	73
FRIDEN, DIV., SINGER CO.	1151	1,495	•					Ten-Key	13	Aut.	Yes	Yes	Yes	73
FRIDEN, DIV., SINGER CO.	1217	625				•		Ten-Key	17	Fully	Yes	Yes	Yes	73
FRIDEN, DIV., SINGER CO.	1114	895		•				Ten-Key	14	Fully	Yes	Yes	Yes	73
FRIDEN, DIV., SINGER CO.	1160	995		•				Ten-Key	14	Fully	Yes	Yes	Yes	73
FRIDEN, DIV., SINGER CO.	1162	1,195		•				Ten-Key	14	Fully	Yes	Yes	Yes	73
FRIDEN, DIV., SINGER CO.	1115	695		•				Ten-Key	12	Fully	No	Yes	Yes	73
HEWLETT-PACKARD	9100A	4,400	•	•	•			Full	14	Fully	Yes	N.A.	Yes	74
HEWLETT-PACKARD	9100B	4,900	•	•	•			Full	14	Fully	Yes	N.A.	Yes	74
IME SALES CORP.	MS 30/60	1,450		•				Ten-Key	16	Fully	Yes	Yes	Yes	75
IME SALES CORP.	86 RM	1,545		•				Ten-Key	16	Fully	Yes	Yes	Yes	75
IME SALES CORP.	DG 308 RM	1,450		•				Abridged	Unlimited	Fully	Yes	Yes	Yes	75
IME SALES CORP.	OP 207	795		•				Abridged	16	Fully	Connected	Connected	Yes	75
IME SALES CORP.	PF 317	595		•				Ten-Key	16	Fully	Connected	Connected	Yes	75
IME SALES CORP.	IME System	7,907		•		•		Ten-Key	16/156	Fully	Yes	Yes	Yes	75
LAGOMARSINO-TOTALIA	8381	595				•		Ten-Key	12/13	Fully	No	Yes	Yes	76
MONROE	570	685				•		Ten-Key	10/15	Fully	Yes	Yes	No	77
MONROE	111E 116	345				•		Ten-Key	11/12	Fully(no div.)	Yes	Yes	No	77
MONROE	920	695		•				Ten-Key	12	Fully	No	Yes	Yes	77
MONROE	820	895		•				Ten-Key	14	Fully	Yes	Yes	Yes	77
MONROE	950	1,050		•				Ten-Key	16	Fully	Yes	Yes	Yes	77
MONROE	990	1,250		•				Ten-Key	16	Fully	Yes	Yes	Yes	77
NCR	NCR 18-1	875		•				Ten-Key	14	Fully	Yes	Yes	Yes	78
NCR	NCR 18-2	1,095		•				Ten-Key	16	Fully	Yes	Yes	Yes	78
NCR	NCR 18-3	1,275		•				Ten-Key	16	Fully	Yes	Yes	Yes	78
NIPPON COLUMBIA CORP. OF AMERICA	DEC61A4 Denon	995		•				Ten-Key	14	Fully	Yes	No	Yes	79
NIPPON COLUMBIA CORP. OF AMERICA	621	895		•				Ten-Key	14	Fully	Yes	No	Yes	79
NIPPON COLUMBIA CORP. OF AMERICA	521	795		•				Ten-Key	12	Fully	Yes	No	Yes	79
NIPPON COLUMBIA CORP. OF AMERICA	411	595		•				Ten-Key	12	Fully	No	No	Yes	79
NORTH AMERICAN PHILIPS	P251	1,195	•					Ten-Key	14	Fully	Yes	Yes	Yes	80
OLIVETTI UNDERWOOD	Programma 101	3,850	•					Ten-Key	22	Pro-grammable	Yes	Yes	Yes	81
OLIVETTI UNDERWOOD	Logos 328	1,295	•					Ten-Key	22	Fully	Yes	Yes	Yes	81
OLIVETTI UNDERWOOD	D-26	575				•		Ten-Key	12/13	Fully	Yes	Yes	Yes	81
OLIVETTI UNDERWOOD	D-24	550				•		Ten-Key	12/13	Fully	Yes	Yes	Yes	81
OLIVETTI UNDERWOOD	M-26GT	450				•		Ten-Key	12/13	Fully	Yes	Yes	Yes	81
OLIVETTI UNDERWOOD	M-24	375				•		Ten-Key	12/13	Fully	Yes	Yes	Yes	81
OLIVETTI UNDERWOOD	M-20	346				•		Ten-Key	10/11	Fully	Yes	Yes	Yes	81
OLYMPIA U.S.A.	ICR412	795		•				Ten-Key	24	Fully	Yes	Yes	Yes	82
OLYMPIA U.S.A.	RAS412	425				•		Ten-Key	12	Semi	Yes	Yes	Yes	82
PAILLARD	Hermes 167	645				•		Ten-Key	12/13	Fully	Yes	Yes	Yes	83
PAILLARD	Hermes 114	N.A.	•					Ten-Key	14	Fully	Yes	Yes	Yes	83
PAILLARD	Hermes/Precisa 370	N.A.	•					Ten-Key	14	Fully	Yes	Yes	Yes	83
REMINGTON RAND OFFICE MACHINES	EDC III	970		•				Eleven-Key	20	Fully	Yes	Yes	Yes	84
REMINGTON RAND OFFICE MACHINES	104	750				•		Ten-Key	16/17	Fully	Yes	Yes	Yes	84
REMINGTON RAND OFFICE MACHINES	DM 99140	675				•		Ten-Key	13/14	Fully	No	No	Yes	84

Shown here are representative models; chart does not purport to show firm's complete line.

mal point may be either pre-set to any one of five positions, or may be floating to automatically locate itself. Two storage registers are provided by a 14-digit memory storage and a constant memory, and the machine features automatic round-off of the product when performing multiplication problems.

Forming part of the Series C machines offered by Burroughs is the C4315, a 16-digit printing calculator with two storage memories.

Bridging the gap between the electronic printing machines and the display calculators are those which can be converted to give print-out by the addition of an optional printer. Certain calculators from Wang, Sony and Hewlett-Packard can be used as display machines and, when nec-

AM's GUIDE TO CALCULATORS *Continued*

MANUFACTURER OR DISTRIBUTOR	MODEL NAME	PRICE	TYPE: Electronic Printing	TYPE: Electronic Display	TYPE: Electronic Printing/Display	TYPE: Mechanical Printing	TYPE: Rotary	KEYBOARD (Full, Abridged, 10-Key, etc.)	CAPACITY (No. of Columns)	FULLY OR SEMI AUTOMATIC	STORAGE FACILITIES (Yes or No)	BACK TRANSFER FEATURE (Yes or No)	DECIMAL POINT IDENTIFICATION (Yes or No)	INQUIRY CARD NO. TO CIRCLE FOR MORE DATA
REMINGTON RAND OFFICE MACHINES	DM 99120	549				•		Ten-Key	11/12	Fully	No	No	Yes	84
REMINGTON RAND OFFICE MACHINES	DX 94	399				•		Ten-Key	10	Semi	No	No	Yes	84
REMINGTON RAND OFFICE MACHINES	EDC IIIA	895		•				Eleven-Key	20	Fully	Yes	Yes	Yes	84
REMINGTON RAND OFFICE MACHINES	EDC I	599		•				Ten-Key	13	Fully	No	Yes	Yes	84
REMINGTON RAND OFFICE MACHINES	EDC I-D	695		•				Eleven-Key	13	Fully	No	Yes	Yes	84
SCM CORP.	414	895		•				Ten-Key	14	Fully	Yes	Yes	Yes	85
SCM CORP.	516	1,095	•					Ten-Key	16	Fully	Yes	Yes	Yes	85
SCM CORP.	616	1,295	•					Ten-Key	16	Fully	Yes	Yes	Yes	85
SCM CORP.	1016 PR	2,495	•					Ten-Key	16	Fully	Yes	Yes	Yes	85
SCM CORP.	212 A	695				•	•	Ten-Key	12	Fully	Yes	Yes	Yes	85
SCM CORP.	314	755				•		Ten-Key	14	Fully	Yes	Yes	Yes	85
SHARP	361P	N.A.	•					Ten-Key	16	Fully	N.A.	Yes	Yes	86
SHARP	361M	N.A.		•				Ten-Key	16	Fully	Yes	Yes	Yes	86
SHARP	18D	795		•				Ten-Key	12	Fully	Yes	Yes	Yes	86
SHARP	QT-8B	495		•				Ten-Key	8	Fully	No	No	Yes	86
SHARP	761	N.A.	•					Ten-Key	16	Fully	Yes	Yes	Yes	86
SHARP	661	N.A.	•					Ten-Key	16	Fully	Yes	Yes	Yes	86
SHARP	662	N.A.	•					Ten-Key	16	Fully	Yes	Yes	Yes	86
SONY	ICC 400W	925		•				Ten-Key	14	Fully	Yes	Yes	Yes	87
SONY	ICC 500W	1,125		•				Ten-Key	14	Fully	Yes	Yes	Yes	87
SONY	ICC 600W	1,250		•				Ten-Key	14	Fully	Yes	Yes	Yes	87
SONY	ICC 2500W	1,650		•				Ten-Key	15	Fully	Yes	Yes	Yes	87
TOSHIBA-AMERICA	BC-1211S	495		•				Ten-Key	12/15	Fully	Yes	No	Yes	88
TOSHIBA-AMERICA	BC-1212	695		•				Ten-Key	12/15	Fully	Yes	Yes	Yes	88
TOSHIBA-AMERICA	BC-1611	1,050		•				Ten-Key	16	Fully	Yes	Yes	Yes	88
TOSHIBA-AMERICA	BC-1623G	1,395		•				Ten-Key	16/31	Fully	Yes	Yes	Yes	88
TOSHIBA-AMERICA	BC-1413P	1,495				•		Ten-Key	14	Fully	Yes	Yes	Yes	88
VICTOR COMPTOMETER	Series 10 10-871	650				•		Ten-Key	14	Fully	Yes	Yes	Yes	89
VICTOR COMPTOMETER	1503	1,595	•					Ten-Key	14	Fully	Yes	Yes	Yes	89
VICTOR COMPTOMETER	1503R	1,695	•					Ten-Key	14	Fully	Yes	Yes	Yes	89
VICTOR COMPTOMETER	1510	1,895	•					Ten-Key	14	Fully	Yes	Yes	Yes	89
VICTOR COMPTOMETER	1510R	1,995	•					Ten-Key	14	Fully	Yes	Yes	Yes	89
VICTOR COMPTOMETER	10-471	575				•		Ten-Key	14	Fully	Yes	Yes	Yes	89
VICTOR COMPTOMETER	Series 1400 14/322	995		•				Ten-Key	14	Fully	Yes	Yes	Yes	89
VICTOR COMPTOMETER	14/321	795		•				Ten-Key	14	Fully	Yes	Yes	Yes	89
WANG LABORATORIES	320S	1,282		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	310S	1,087		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	300SE	980		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	362	2,795		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	360	2,495		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	320	2,095		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	310	1,805		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	300	1,600		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	200SE	860		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	210SE	970		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	240SE	1,100		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	360SE	1,497		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	700	4,900		•				Ten-Key	12/24	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	380	3,495		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	370	3,995		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90
WANG LABORATORIES	250SE	1,210		•				Ten-Key	10/14	Fully	Yes	Yes	Yes	90

Shown here are representative models; chart does not purport to show firm's complete line.

Calculators CONTINUED

essary, be coupled with a printer attachment to give permanent record of their calculations.

In the case of Wang calculators, all models with the exception of the Model 700 are compatible with the Model 301 column printer. Sony models 400W, 500W and 600W may be converted to paper print-out with the POA attachment, while Hewlett-Packard System 9100, which features capabilities such as log, trig and subroutine techniques, may be linked with a printer or an X-Y plotter. This attachment makes graphs of problems solved by the calculator, either as a series of points, or as a continuous curve.

The greater number of electronic calculators on the market at the moment display their results, either on a cathode ray tube, or by a row of Nixie tubes.

Nixie tubes provide a 14-digit display on the Brother Pro-Cal

Silence and speed are two advantages of electronic display models.

Calculators CONTINUED

514. Entries can be made on this machine as they would be written, through the use of logical indexing, and the calculator may be pre-set to round up, round down or round off.

Storage registers on the Cintra Scientist 909 can be increased up to 122, from the basic 26. By adding the 927 Programmer, up to 25,600 consecutive steps can be performed automatically in addition to loops, branches and subroutines, making the 909 applicable to many scientific, data processing and statistical operations.

Addition, subtraction, multiplication and division can be carried out at speeds up to .003 of a second on the Dodwell Deltek, which features a Nixie tube display, adjustable to flat or upright positions. In addition, a two-step read-out system provides 15-digit performance on the eight-figure scale, with a magnetic memory core allowing chain multiplication, division and automatic exponential calculations.

Designed for simplicity, the Busicom Model 120DA unit eliminates more complex functions and auxiliary memories which are not always needed for routine office calculations. Despite this, the machine can accomplish addition and subtraction in .01 seconds, multiplication in .25 seconds, and division in .3 seconds. Constants are automatically retained in multiplication or division, so that if a series of numbers has to be divided or multiplied by the same number, only the variable number need be keyed into the machine for each calculation.

Also designed for simplicity of operation is the Dictaphone 1420, which has a split keyboard to eliminate errors. Add and multiply keys are located on the right, with subtract and divide keys on the left, so that the possibility of wrong keying is reduced.

SINGLE

COLOR coding and lighted multiplication and division keys are used for operator convenience on the Facit-Odhner Model 1127. An accumulating register accepts both positive and negative intermediate results, with a single key used to transfer figures to the memory. A light in the read-out window indicates when a number is stored in the accumulating register.

Floating decimal point, and the elimination of excess numbers from the right, instead of from the left as is more normal, is intended to end overflow on the Model 1114 from Friden Div., Singer Co. Using a 14-digit capacity display, the machine cuts off decimal digits instead of whole numbers when an answer exceeds capacity, allowing whole number calculations to show answers up to 99 trillion on the display.

Satellite keyboards are available for the IME 86S, which allows two operators at separate desks to use the one master unit

for calculations. Designed for commercial and scientific mathematical problems, the 86S features three operational and four random access working accumulating registers, and 16-digit capacity. Other optional peripherals compatible with the calculator are an output unit designed to recode output to drive most standard printers, paper tape punches and similar equipment, and a programming device providing eight contiguous 64-step program zones.

AUDIBLE

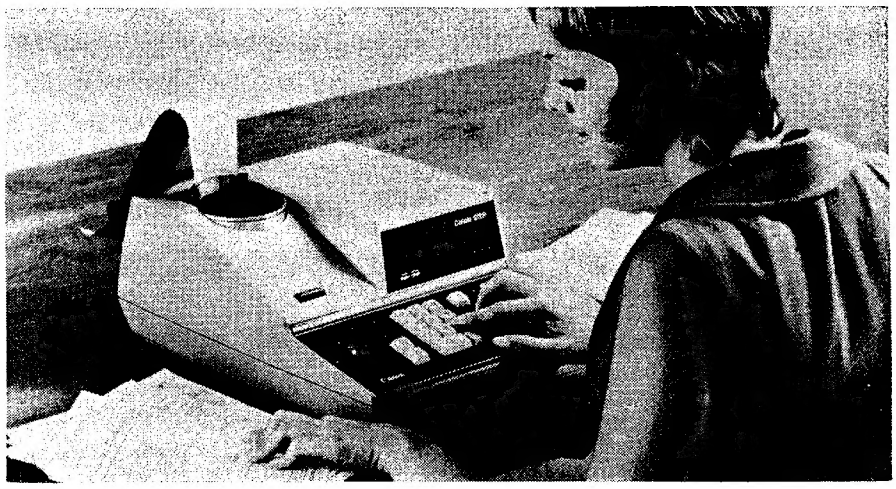
DISPLAY panel on the Monroe Model 820 consists of a two-line cathode ray tube. Entries and results are shown up to 14 digits, ¼-inch high, and the machine features two memory units which store all numbers entered. Designed for easy portability, the 820 uses integrated circuitry, and weighs 14 pounds. A visual and audible signal indicates when a computation overflows capacity.

Integrated circuitry is also used in the Addo-X Model 9958, which features two working registers and two memory banks for storage and accumulation. Capacity is 16 digits, with eight decimal places and optional round-off. In addition to usual functions, the machine has square root and power-raising capability.

Automatic zero suppression is one of the features of the Olympia ICR 412. This facilitates visibility by eliminating superfluous zeros to the left and right of the result shown on the 24-digit display. This consists of a row of Nixie tubes, which show 12 positions at a time, but which allow calculations up to 24 digits. Five registers are incorporated; three for normal arithmetic operations, one for storage accumulation, and one for the memory. Positive or negative values may be stored in this memory, and used at any time during a calculation as a divisor, dividend, subtrahend, multiplier or multiplicand. The calculator is cleared by switching it off.

Keyboard of the Remington EDC III uses nine digit keys, zero or cipher bar, and decimal key in place of the more usual ten-key layout. Three accumulator controls gather results according to need, and a transfer key sends data from either of two accumulators to the display for further use. The ten-Nixie tube display can be extended by use of a display key to include read-out of to ten additional digits.

All four mathematical functions, with memory and constant capabilities are included in the Model 512 from Commodore. In spite its small size of 13 inches by 4½ inches by 5 inches, the machine can also chain multiply, reveal sub-totals and credit balances. Results and subtotals are displayed on a 12-digit Nixie tube row, and all operations are controlled by four function keys.



New machines provide almost silent printout without ink, pads or type.

Calculators CONTINUED

Weight of the unit is 3.75 pounds.

Part of the NCR 18 Series is the NCR 18-1, which includes among its features automatic round-off, decimal setting up to seven places, and a 14-digit Nixie tube display. Using integrated circuitry, addition and subtraction are performed in two milliseconds, while other calculations take a maximum of 430 milliseconds. While larger machines in the 18 Series have two core memories, the 18-1 uses a single electronic memory, and includes constant multiplier and divisor.

MEMORY

CONSTANTS in multiplication and division are automatic in the Victor 14-321, which also accumulates positive and negative products, quotients and sums in its memory register. The visible accumulating memory provides an automatic total of negative and positive extensions, and accumulations in the memory can be transferred to the working register for further calculations.

Item count, accumulation of multipliers, and both fixed and floating decimals are among the features of the Sharp CS-361M. Designed for more sophisticated calculations, the machine includes six memory banks and three working registers. With a 16-digit capacity display, the 361M features zero suppression on the read-out, and an automatic square root capacity.

Built-in magnetic tape drive with read/write capability is included in the Wang 700, which takes tape cassettes holding up to 20 960-step blocks of programs for use when needed. Program instructions are learned from the basic keyboard, and additional commands may be interposed by the use of a group of special keys. These provide instructions for the location of the desired program, and loops and subroutines are possible. Two registers are displayed on two twelve-digit rows of Nixie tubes.

Moving from the electronic machines to the electro-mechanical calculators, the only non-electronic model in the Paillard line is now the Hermes 167. Available in a 12/13 capacity with single, double and triple cipher keys, this printing calculator is capable of automatic division, multiplication, recall, squaring and shortcut multiplication. Weighing 20 pounds, the machine also features memory storage and credit balance.

Automatic shortcut multiplication, both positive and negative, is also a capability of the Largomarsino-Totalia Model 8381. There is no limit on the number of figures in the multiplicand or multiplier, and there is automatic correction of a wrong multiplicand by entering a new one.

Incorrect entries made in multiplication are also automatically erased by the correct entry with the Addo-X Model 4383. A ten-key machine, this model needs no pre-setting for different functions, and can switch from

Calculators CONTINUED

addition to multiplication, or subtraction to division, without interruptions.

Electric clearance and repeat keys are included in the Model 202 from Commodore. Designed for easy read-off with large printed figures, the 202 has a capacity of list 10, total 11, with credit balances shown in red.

Electronic, electro-mechanical or rotary; Nixie tube or cathode ray tube; print-out or display? How is a manager to decide what type of machine will best fit in with his requirements and budget?

There are various peripheral considerations—electronics are claimed to break down less often than mechanical machines, but the wait for a skilled repairman or parts may be longer in the event of breakdown. Obsolescence is a factor in a rapidly changing market, and while prices are coming down, the electronic machines, especially those with print-out, are still priced above mechanical models.

But by examining what is needed from a machine, the choice can usually be narrowed down to a group of suitable models in roughly the same price bracket from which a final selection can be made. The new, high-speed, electronic calculators offer versatility and sophisticated capabilities, while electro-mechanical machines fulfill less complex requirements for a lower initial outlay. A clear analysis of what the machine will be asked to do will point the way to the calculator best suited to the job you have in mind for it. □

Late Copiers

Received too late for the December article, "Copiers '70: New Processes and Capabilities," were two electrostatic machines, the SCM 111, a console machine which leases for $77 a month and sells for $2,795, and Ditto's Autoload which sells for $765.

Average cost per copy with the 111 is 2.7 cents, and with the Autoload, 3.5 cents.